

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

PCM0016 – CHEMISTRY

(All sections / Groups)

11 FEBRUARY 2023

9.00 a.m. – 11.00 a.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 2 pages only excluding the cover page.
2. Attempt **ALL** questions. Distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

QUESTION 1 [30 MARKS]

- (a) Complete the table below by giving one example (symbol and name):

Aspect	Symbol	Name
A carbon compound with three molecules of oxygen	(i)	(ii)
A basic compound	(iii)	(iv)

[4 marks]

- (b) Equation shows the incomplete combustion reaction of ethane: $\text{C}_2\text{H}_6(\text{g}) + \text{O}_2(\text{g}) \rightarrow$
 At STP, a 45 g sample of ethane was burnt in 150 L of oxygen.

[Atomic mass: H = 1.0; C = 12.0; O = 16.0]

- (i) Complete and balance the equation. [2 marks]
 (ii) Find the maximum volume of carbon dioxide would be produced. [6 marks]

- (c) Based on your equation in (b)(i), use the standard enthalpies of formation given below to calculate the standard enthalpy of combustion of ethane.

Formula and state of compound	$\text{C}_2\text{H}_6(\text{g})$	$\text{CO}_2(\text{g})$	$\text{H}_2\text{O}(\text{l})$
Standard enthalpy of formation (at 298 K) / KJ mol^{-1}	-85	-394	-286

[3 marks]

- (d) Give examples of the allotropic form of carbon and draw their structures.

Crystalline Form	Form 1	Form 2
Name of form		
Structure (Draw)		

[8 marks]

- (e) Write the formula of ideal gas law. Then, explain the relationship between density and molar mass. [3 marks]

- (f) Calculate the heat released for the reaction (at 25 °C and 1 atm) below:

Equation	$\text{H}_2(\text{g})$	+	$\text{Cl}_2(\text{g})$	$\rightarrow$	$2 \text{HCl}(\text{g})$
Information	1.5 L, $\rho = 0.09 \text{ g/L}$		Excess reagent		$\Delta H_f^\circ(\text{HCl}) = -92.17 \text{ kJ/mol}$

[4 marks]

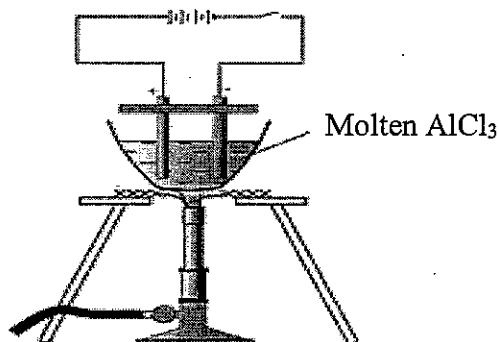
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QUESTION 2 [30 MARKS]

- (a) The diagram below shows part of the Periodic Table. Answer the questions that follow.

I	II		III	IV	V	VI	VII	VIII
								<i>p</i>
	<i>q</i>					<i>r</i>	<i>s</i>	
						<i>t</i>		

- Rank elements *r*, *s* and *t* in order of decreasing atomic size. [1 mark]
 - Compare the ionic radius of q^+ and q^- . Explain your answer. [3 marks]
 - Which element is the most electropositive? Explain your answer. [2 marks]
 - Which element is an inert gas. Explain why it is called an inert gas. [2 marks]
- (b) Write the set of four quantum numbers for an electron in a $5p$ orbital. [3 marks]
- (c) Draw the electronic configuration of *X* (not the correct symbol. Proton number = 28). Also, deduce the group and period of *X* in the Periodic Table. [3 marks]
- (d) Figure below shows an experimental setup of an electrolysis process. Calculate the number of grams of aluminium deposited at the end of the process. [Atomic mass: Al = 27; Faraday constant = 96500 C/mol e^-] [4 marks]



Electrolysis data
 Current supplied : 12 A
 Supplied time : 1 hour

- (e) A 0.5 M ethanoic acid, CH_3COOH is 4.5% dissociated when dissolved in water. Calculate the pH of the acid. [4 marks]
- (f) Draw the Lewis structure and name the molecular geometry for:
 (i) CO_3^{2-} and (ii) PH_3 [6 marks]
- (g) Consider the following reaction: $2\text{A (g)} + \text{B (g)} \longrightarrow \text{C (g)} + \text{D (g)}$. If A follows first order kinetics and B follows second order kinetics, find the overall order and the unit for rate constant, *k*. [2 marks]

End of question